AUSTRALIAN SOCIETY FOR LIMNOLOGY

NEWSLETTER

Volume 25. Number 3. August 1987

Registered by Australia Post

Australian Society for Limnology

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Australian Society for Limnology Newsletter

Volume 25 Number 3 August 1987

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Copy deadline for next issue:

Material for publication in the November issue of the Newsletter should be sent to the Editors before 15 October 1987.

Australian Society for Limnology

The Australian Society for Limnology is an association of over 400 people with professional or amateur interests related to Australian inland waters. Since its inception in 1961, the Society has played an important role in fostering limnology work in this country. The ASL promotes liaison between limnologists in academic, private and governmental institutions and has a vested interest in the conservation of aquatic and related resources. Annual conferences are held near centres of limnological interest, and the programme includes scientific sessions, field excursions and social activities.

The ASL produces a newsletter with notes on activities, articles of general interest, book reviews and conference announcements; a Bulletin of original scientific papers and occasional Special Publications. A further publication is the Directory of Australian Limnologists.

Membership details

Membership applications are welcome; five classes of subscribing membership are available:

Ordinary Members:	$20.00
Student Members:	$10.00
Life Members:	$200.00
Institutional Members:	Fees on application
Sustaining Members:	Fees on application

Membership subscriptions cover the period from 1 July to 30 June and members receive all publications. Members may also choose to receive the Australian Journal of Marine and Freshwater Research, the Australian Journal of Zoology and/or the Australian Journal of Botany at reduced rates. The subscription period for each journal is the calendar year following the year in which the subscription is paid.

Enquiries relating to membership should be directed to:

Mrs M. Hart
Treasurer/Membership Officer ASL
22 Netherby Avenue
Mulgrave Vic. 3170

EDITORIAL

The first task that we wish to undertake as the new editors of this Newsletter is to thank Michele Barson for her work as editor for the two preceding years. It has taken five of us some time to put this edition together and the thought of doing it single-handedly, as Michele was doing, is rather daunting and enlightened us to the considerable effort that Michele was putting in. A sincere thank you, Michele, on behalf of ASL.

Secondly, we would like to draw your attention to Max Finlayson's letter on the re-structuring of ASL - a topic that was raised by Ian Campbell in the previous issue (Volume 25, No. 2) of this Newsletter. Obviously the Executive does need re-structuring - proper regional representation is a must, for instance, and we hope that changes will be made at the next AGM in Townsville. However the more debate that can take place in this Newsletter before that time the better.

Finally, we see the Newsletter as a means both for maintaining contact between limnologists throughout Australia and of obtaining a higher profile for ASL through articles and comments published in it. Some of the comments in this issue may not be what you would have written or you may be annoyed by the omission of news or information that you feel is important- if so the onus is now on you to write something better for the next issue. We are very much dependent upon the material that you send to us - so start writing now!

THE NEXT ASL CONGRESS

Will be held in Townsville at James Cook University. Dates have yet to be finalised, but it will most likely be April or May (hopefully the common week, Eds.) according to Richard Pearson. Richard will have more details ready for the next newsletter.

So now you can't claim you haven't heard about it. Honours and postgraduate students are reminded that there are student travel awards provided they give a paper and are current members of ASL. Response to the travel awards have been disappointing over the last couple of years, so start thinking about your papers NOW. Once students get to Townsville, they can also enter for the student prize too. Full details in the next Newsletter.

THE 26th CONGRESS

The 26th Congress and AGM were held at the Lake Hume Resort near Albury from May 8th to 11th,1987. In keeping with a well established tradition informality was the keynote and the chance to exchange ideas, talk about recent work and renew limnological friendships more than compensated for the slightly eccentric projection facilities and other organisational glitches. The River Murray symposium which preceded the meeting and the tour of the Peter Till Laboratory on the following Monday were optional extras which gave Congress participants a chance to learn more about the limnology of the Murray - Darling Basin and the research in progress.

Highlights of the Congress included :
....the mugs
....the attempt by an Albury club to raise the dress standards of ASL members
....the appearance of not one but two door prizes and the lengths to which Monash postgrads went in an attempt to receive them
....David M. Scienceperson
....the local colour injected into the dying stages of the Sunday night spitroast and the mysterious disappearance of all the buttons on Max Finlaysons' shirt.

RESULTS OF THE FERRIC PERSON EVENT

Whilst to the non-participating onlooker the FPE may have looked similar to a common or garden fun run it was distinguished from the latter by the fact that it was held after dark (we should have known that the AGM wouldn't finish on time). As a consequence the hardy competitors undertook a 6 km run down and up an unlit course which included compulsory crossing of two barbed wire fences. A dead heat was declared for first place because neither of the first two runners was prepared to throw themselves across the path of an oncoming vehicle in a last ditch attempt to reach the finishing line on the other side of the T junction. Not really FP behaviour!

Results	Time
Stuart Halse	21.43
Sandy Morrison	21.43
Dave Robinson	22.01
Peter Breen	22.20
Colin Leitch	23.02
Paul Horne	23.30
Andrew Storey	24.48
Alex McNee	25.12
Andrew Morrison	26.04
Mark Williams	26.42
Michael Pendebury	28.43
Jenny Davis	28.56
Mark Rymmer	29.39
Ian Campbell	32.58
Bob Fry	34.43
Richard Lin	38.20
Sue Harrington, Jane Chambers, and Adrian Pinder (to bridge and return)	21.35

The Swamp
THAT SWAMP RANGER IS BECOMING A REAL MENACE
WHAT'S HE POSSIBLY HOPE TO ACHIEVE TRUDGING WAIST DEEP IN MUD ALL DAY TAGGING EVERYTHING IN SIGHT ?
PROMOTION TO A DESK JOB!

PROPOSED MOSQUITO CONTROL ASSOCIATION OF AUSTRALIA

On 18-19 May 1987, the Commonwealth Department of Health sponsored a workshop/seminar on "Mosquito Vector Control in Australia - Current Status and Future Prospects". Participants, who included representatives from government, industry, research, medical entomologists, and health inspectors, all strongly supported the formation of a broadly based Mosquito Control Association of Australia.

We would like to hear from people involved in mosquito control in Australia who are interested in forming/joining the proposed Mosquito Control Associaton of Australia.
If you would like further details, please send your name and address to:

Peter Liehne
Senior Medical Entomologist
Communicable Diseases Branch
Commonwealth Department of Health
P.O. Box 100
Woden ACT 2606

NEW JOURNALS

A number of new journals have sent us glossy pamphlets asking us to ask all limnologists to subscribe and/or submit papers. They are:

Hydrological Processes published by John Wiley, $US 110.00 per volume of 4 issues.

Tropical Freshwater Biology published by Idodo Umeh Publishers Ltd, 52 Ewah Road, PO Box 3441, Benin City, Nigeria, West Africa. $US 25.00 per issue.

Regulated Rivers published by John Wiley, $US 110.00 per volume of 4 issues.

FUNDING OF TWELVE AUSTRALIAN CENTRES OF CONCENTRATION IN WATER RESEARCH ANNOUNCED

The following summary represents a condensed version of the press statement released by the Federal Government in early June. Upon receipt of this statement the editors of this Newsletter scanned the newspapers available in Perth (The West Australian, The Australian, and The Age), but found no hint of this release. Was this the case elsewhere in Australia?. Undoubtably all news at the time was overshadowed by the impending federal elections, but even so, this lack of press coverage would appear to indicate a disinterest by the press and therefore(?) Australians generally in water research. A sad state of affairs for the worlds' second driest continent!!

On 16 June 1987 Senator Evans announced the largest single Commonwealth initiative to date in the area of water research, a $5.5 million package funding twelve national "Centres of Concentration".

The twelve centres have been recommended by the Australian Water Research Advisory Council (AWRAC) following an evaluation of 96 proposals received from institutions around Australia.

The Commonwealth Government will provide funds totalling $1.82 million per year for three years for the centres with possible extension of a further two years. The centres are a co-operative venture with the water industry and have generated intense interest and substantial support from both the water industry, Universities and CSIRO. In the first year this support will total $1.1 million.

The centres will provide greatly enhanced capacity through the provision of block grants for full time expert staff and equipment for research on the major water problems facing Australia, such as degradation and salinisation of the nation's rivers, low cost water and sewerage treatment for small communities, the better use of Australia's groundwater resources and the need for better overall financial and economic management in the water industry.

This initiative, for which funds were tentatively allocated in the 1986-87 FWRAP Budget, but in relation to which planning has just come to fruition, follows a series of other major water initiatives by the Hawke Government, including:

- the establishment of the Murray-Darling Basin Ministerial Council, in November 1985 to bring together the water, land and environment Ministers from the Commonwealth, NSW, Victorian and SA Governments to tackle the water quality, salinity and land degradation problems of the Basin. The initiative will involve the

replacement of the River Murray commission with a new statutory "Murray-Darling Basin Commission" with wider ranging functions. A Community Advisory Committee has been established to aid communication between interest groups in the region and the new bodies, and substantial strategic planning activity has already occurred;

- the Country Towns Water Supply Improvement Programme (COWSIP) begun in 1983 and which has already provided $49 million to improve the water supply quality and quantity to no less than 348 small towns across the nation;

- the formation of the Australian Water Research Advisory Council (AWRAC) to advise on water research objectives and co-ordinated national programmes to achieve them - about $4 million has been spent to date;

- the building of the Burdekin Falls Dam at a cost of $129 million, a massive investment by the Commonwealth in the future prosperity of North Queensland;

- the establishment of the Murray-Darling Freshwater Research Centre at Albury-Wodonga (the Peter Till Laboratory), which is mounting the most comprehensive programme of research on a river system yet undertaken in Australia and should result in a significant improvement in water quality for those using the river as a source of domestic water and ensure its long term value as a major tourism and recreational attraction;

- expenditure overall by the Hawke Government since coming to office on the Federal Water Resources Assistance Programme of $254 million - with substantial expenditure on floodplain management, resource assessment, conservation, irrigation and salinity control as well as the activities mentioned above.

The twelve centres of concentration in water research are:

Centre for Stream Ecosystem Research
-Chisholm Institute of Technology and Monash University; Melbourne

Australian Centre for Catchment Hydrology
-CSIRO Division of water Resources Research; Canberra

Centre for Catchment and In-Stream Research
-Griffith University; Brisbane

Centre for Wastewater Treatment Processes
-University of New South Wales; Sydney

Australian Centre for Water Treatment and Water Quality Research
-State Water Laboratory, Engineering and Water Supply Department of South Australia; Adelaide

Australian Centre for Tropical Freshwater Research
-James Cook University of North Queensland; Townsville

Centre for Limnological Modelling
-University of Western Australia; Perth

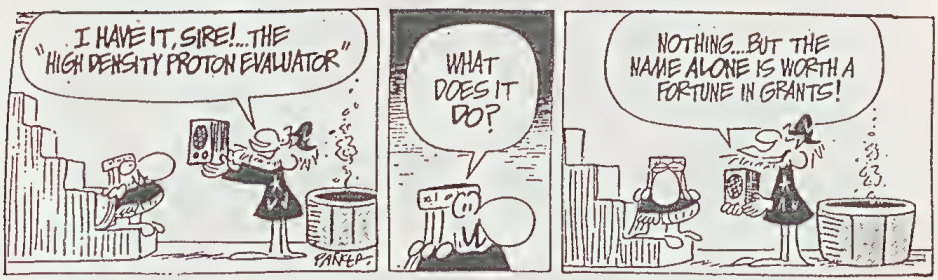
Centre for Environmental Applied Hydrology
-University of Melbourne; Melbourne

Urban Water Policy Unit
-University of New South Wales; Sydney

Centre for Water Policy Research
-University of New England; Armidale, NSW

Centre for Research in Groundwater Processes
-CSIRO Divisions of Water Resources Research and Soils; Flinders University; Adelaide

Centre for Groundwater Management and Hydrogeology
-University of New South Wales: Sydney



LETTER

Ian Campbell in his article to the Newsletter Vol. 25 No. 2 on restructuring of the ASL Executive Committee raised a number of important issues related to the operation of the Society. Included was a perceived need for the Society to become more "professional", to become more effective in its liaison with members, and to increase its profile in the community, and in particular, politically. The premise behind these issues would appear to be that the society wants to become more "professional" and adopt a higher profile. A possible restatement of that premise is that the society (as represented by the views of the members) wishes to play a greater and more influential role in the "debate" over water related issues, and (importantly) obtain more resources to enable individual scientists and institutions to further the cause of limnological science in Australia.

Scientific involvement in the debate over issues such as the utilisation and protection of water resources could possibly lead to more enlightened decisions being made. However, as the "decision-makers" in our country tend to look first at political rather than scientific arguments, can ASL achieve more enlightened (scientifically that is) decision making without becoming more political? The dangers of becoming more political have been raised before, but let me dwell on one of these just briefly. Namely, could the Society tolerate and still function as a broadly based scientific organisation if the political process develops and we eventually fractionalise into ardently opposed groupings. For example, could the public servants who are required to implement Government policies and strategies stay calm and tolerant in the face of damning criticism from the less accountable (to the public) elements from tertiary institutions, especially if they feel the criticism is ill-founded, and worse, was delivered in a forum or manner that left them with no immediate right of reply. That is not purely a hypothetical worst case scenario, but probably an inevitable outcome of a situation where political thought leads to a decline in professional ethics and half-baked or misconstrued information replaces the proven scientific method of unbiased assessment of all the facts.

However, it is time to move onto the second part of my restatement of the premise behind the perceived need to restructure the Executive. It goes without staying that an increase in resources can lead to more employment (sometimes even permanent jobs), purchase of more equipment (sometimes without unwarranted duplication) and eventually the publication of more scientific papers (sometimes even worthwhile ones). The last point is a very interesting one as even the young and inexperienced

scientist knows that the publish-or-perish syndrome does exist in our scientific community, despite token condemnation of the purported obsession with this syndrome in the U.S. Furthermore, they also learn very quickly that the number of papers is one of the prime criteria used for measuring job performance and promotion, allocation of resources, etc. As this gauging of performance is so commonly used we must assume that it is a laudable goal to publish scientific papers as someone else can then count them and make an assessment of our worth to the scientific community. But in reality, we all know that there is a lot more to many jobs, especially if it has an applied and/or managerial nature and your scientific skills are put to more uses than merely reporting your scientific results in the "widely-distributed" scientific literature. But despite assurances that job performance and allocation of scarce research resources (i.e. money) is not based solely on the number of papers we still witness situations where this is done. If the Society, or representatives of the Society partake in this sort of assessment, especially if it is done without a comparable assessment of other activities and tasks required of individuals and organisations, then I suggest that we desperately need proposals to make the Society more professional. If the Society can adopt a professional and well-informed stance on questions related to allocation of the water research dollar, then we may have a chance of rectifying the negative aspects of politicking that appear to be part and parcel of adopting a higher profile.

Thus, in an attempt to overcome the problems of running the Society, some of which were well highlighted by Ian Campbell, I would like all members to offer at least initial support to the recommended changes. In addition, we should consider the question of disenfranchisement of members unable to attend the annual congresses. Why not attempt a system of proxy votes where interested members can instruct, in writing, delegates to congresses how to vote on pre-nominated "tickets". The advantage of this over a postal vote system is that the election takes place and the results are known on the same day without every member having to bother to fill in a voting form and post it away.

In conclusion, I agree that the Society needs to become more professional and to become more effective in its liaison with members and the proposals put forward by Ian Campbell are one way of attempting this. However, we must not forget the many members who do not have the resources to make the pilgrimage to the annual congress.

C.M. FINLAYSON
Jabiru, N.T.

STATE AFFAIRS

Introducing the new all-singing, all-dancing limnological gossip column. Ever wondered what happened to that graduate student who promised faithfully to identify your cyclopoids for you as soon as they had finished their thesis? Did so-and-so manage to score $1.2 million from the Pig Breeders Research Trust for that artificial wetland project? Yes, these and other burning questions can be answered by STATE AFFAIRS.

But seriously, your diligent editors have decided to pilfer an idea successfully employed by the Australian Entomological Society and the Ecological Society of Australia. Our aim is to bring together all that disparate information that is well hidden behind photos of Gareth Jones or the Burdekin River Dam in Water News and similar publications and give it the prominence it deserves. We and your colleagues would like to hear about new projects your group has got together, new employees you have taken on, visitors who have or will be working with you, speculations on why your graduate students haven't finished yet, etc.

In other words STATE AFFAIRS will be much more interesting than Water News or even Times on Sunday (i.e. there will be no wine column). Several people have, over the centuries, already contributed in this fashion of course: but we want MORE. We'd particularly like to hear of things happening outside of universities (...and Chisholm) as well.

To facilitate all this we have bludgeoned a number of people into gathering the good oil for us. Their addresses are given below. So if you have anything interesting you want to publicise, send it to them or phone them and they will pass it on. If you feel like being a regional gossip coordinator yourself, even better! So all you need to know now is that the next Newsletter should be out in late November, but the DEADLINE is OCTOBER 15th.

Our first attempt at STATE AFFAIRS is somewhat patchy, but gives you some idea of what we want, although the contribution from Monash Zoology is perhaps not to be emulated.

A.C.T.

(Our gossiper in Canberra is Dr Richard Norris, Water Research Centre, School of Applied Science, CCAE, PO Box 1, Belconnen ACT 2616.)

The Water Research Centre at the Canberra College of Advanced Education is undertaking a project on the impact of silt from land development on the Murrumbidgee River. Ian Hogg has recently joined the College from Dudley Williams laboratory in Canada and he will be using the project as the basis for his Masters, under the supervision of Richard Norris.

Good interaction is occurring between the CCAE and the National Capital Development Commission who are funding the project and the Department of Territories who are measuring the water chemistry and collecting fish for analysis of gut contents.

Arthur Georges has received a grant from the Australian National Parks and Wildlife Service for a study of the distribution and abundance of the freshwater turtle *Carettochelys insculpta* in Kakadu National Park. Another project on the Biochemical Systematics of chelid turtles, conducted jointly by the CCAE and the Evolutionary Biology Unit of the South Australian Museum, is nearing completion.

Rod Kennett has recently completed his honours project at the ANU on the growth, reproduction and dispersal of *Chelodina longicollis* in the Commonwealth Department of Jervis Bay. He was jointly supervised by Dick Bonwick of the ANU and Arthur Georges of the CCAE.

Bruce Mitchell of the University of Waterloo, Ontario, visited Canberra last month - hosted by CRES. He presented a seminar on integration of land and water management. Professor Mitchell also spent some time at the NCDC and other government organisations discussing this theme.

Derek Low from the NSW SPCC inspected water pollution control facilities for urban runoff with members of the NCDC. They are hoping to implement some of these techniques in NSW.

AAWWA - CCAE held a joint seminar on 23 May 1987 on Water Pollution Legislation in Australia. The morning session focussed on what we have achieved and what the future holds. The afternoon featured a forum on urban runoff control in the ACT, bringing together inspectors, agents and contractors for a lively and worthwhile debate.

The Department of Territories is undertaking a study of Gross Pollutant Traps. These were originally designed to trap trash and bedload material, but may be trapping finer material than expected (including nutrients).

The NCDC, DOT and ADFA are undertaking studies on the use of automated water quality monitoring equipment. The aim is to have a small network of computer monitored stations by early next year.

The NCDC and CCAE are collaborating on the establishment of an aquatic plant data base. The aim is to provide a tool for selecting aquatic plants for pollution control and landscape purposes.

Thanks to Richard Norris and Norrie Sanders for collecting the gossip.

VICTORIA

(Richard Marchant gladly awaits your Victorian contributions. His address is on the inside front cover.)

The Museum of Victoria Survey Department is now called Environmental Records. Only Richard Marchant and Tim Doeg remain of the bustling freshwater empire; together with Sam Lake they are continuing their AWRAC-funded experiments on the effects of physical disturbance on stream macroinvertebrate communities.

In case you haven't heard, Mark Harvey is continuing the water mite taxonomy project funded by ABRS at the Museum of Victoria.

Professor J.V. Ward from the University of Colorado visited the Museum for three months to discuss the downstream effects of dams on invertebrate fauna with Tim and Richard.

Congratulations to Barry Hart, Ian Whatsisname, and Sam Lake for becoming a Centre for Stream Research. Funded by AWRAC, the centre should start soon and will bring together researchers from CIT, Monash Zoology and the Museum of Victoria. Strangely, Ian Campbell has run away to James Cook Uni's Zoology Department for 12 months.

Presumably Paul Bailey, who has just started teaching at CIT after a Postdoc. at Griffith University, is not overjoyed at Ian's departure. Kim James is another new CIT recruit. She is working with Ian Campbell on decomposition processes in East Gippsland streams - another AWRAC funded project.

Patrick de Deckker, from Geography at Monash, has also departed for warmer climes. After sampling a lake in Tahiti in early July, he is spending time at the U.S. Geological Survey in Denver to co-edit a book. Thereafter he goes to Ottawa for the International Quaternary Association meeting, then to the Canadian Centre for Inland Waters and then will work with John Small at Queens University, Ontario, prior to returning to Australia. Phew!

At the Rural Water Commission, Leon Metzeling (great Christian name!), Vince Pettigrove, Gary Bennison and new recruit Julia Reed are all working hard on a variety of macroinvertebrate projects. Paul Horne left the RWC after two years of work on black flies and flow environments in artificial streams; he is now doing things with pesticides for the Department of Agriculture at Burnley. Roger Croome started in early July as head of the water quality assessment section.

And finally, the following contribution from Monash Zoology has been considerably edited down from a barely legible document several volumes long. The libellous original has been passed on to the National Crimes Authority and interested readers could, therefore, expect to see it serialised in the Times on Sunday shortly.

Sam Snake, still directing the "limno shuffle" by his Young Talent Time Team, took most of his clothes off during a titillating talk on "Disturbance and distribution" at Chisholm. He and his partner in crime, Ian "Waders" Bayly (just back from a study of planktonic sheep and diurnal lamb migration in his homeland) are mustering up the courage to take another group of eager (?) young students out on a third year field trip to the wilds of Marysville.

As usual they have collected a seething mass of unsavoury graduate students. Among them are: Fiona Mckenzie working on moss fauna and keeping the tobacco industry afloat; Ben Gawne is being scared by the number of species of *Agapetus* he has found; Michael Barry is waving still more predators at hapless *Daphnia* and is growing a beard; and the new arrival, John Kirkwood, has achieved notoriety in spheres generally unconnected with his Antarctic research..

Of the long term inmates, Ros "killer" St Clair is tired of the "green screen" but is nearly finished - good news for all you Leptocerid buffs. Sabine Schreiber, of drift fame, was recently seen typing a pile of draft references which is a sure sign of the light at the end of the tunnel. Her son Nikolas is proof reading both theses and Sam gets to draw pictures on bits of scrap paper (or is it the other way

around?). Door prize winner Nick O'Connor is still engaged on his woodwork after hitting a few snags at ASL, whilst door prize aspirant Gerry Closs has gone one better by being a constant feature on page 3 of the "Whittlesea Post". Anthony Sokol, the tadpole-loving Decapod taxonomist, achieved a high profile during a bout of lager frenzy at a party held in his honour. He has decided to go to South America next week until the fuss dies down. He will not be looking for *Cherax* in Rio.

Finally, Andrew John Boulton has just recovered from a dose of non metric multidimensional scaling. He hopes to finish his temporary stream work by December in time for a fishing trip to W.A. (Drs Knott and Edward would be well advised to take evasive action - Eds.)

QUEENSLAND

(... is a very big place. Southerners send their items to Dr Angela Arthington, AES, Griffith University, Nathan 4111. Limnologists who play in crocodile infested waters should try Dr Richard Pearson, Zoology Department, James Cook University, Townsville 4811).

AES at Griffith University has acquired funds from AWRAC and matching funds from Griffith University and the Queensland Water Resources Commission to form a Centre for Catchment and Instream Research. They are in the process of building a biology and soils lab to accommodate their research projects, so things are really bustling.

Diane Conrick and Brian Bycroft have returned to the limnological fold to work with Angela Arthington on the effects of the new Bjelke-Petersen dam project on fish and water quality. The study is being funded by the Queensland Water Resources Commission, and if you're interested in how many megalitres are involved see Australian Fisheries, March 1987, pp.11-12.

James Cook University has also become an AWRAC funded centre: they are called the Australian Centre for Tropical Freshwater Research. Additional funding is being provided by the Queensland Water Resources Commission and Richard Pearson will tell us all about the Centre in the next newsletter.

Ian Campbell will be among the first visitors to the Centre. He is spending 12 months on study leave, hunting mayflies no doubt.

As you read this, ANZAAS will be in full swing (24-28 August). There is a well-patronised freshwater ecology section including contributions from Angela Arthington, Peter Mackey, Brian Timms and Russel Shiel.

In case you hadn't noticed, ASL's 1988 Congress will be held at James Cook (yes! Townsville!) in April or May. I daresay R. Pearson would appreciate any offers of help in organising the event.

NORTHERN TERRITORY

(Max Finlayson eagerly awaits your news. He is at the Alligator River Region Research Institute, Post Office, Jabiru 5796.

Patrick McBride is absent from Jabiru on one year's leave.

Maryann McKaige is still thawing out from her Thredbo experiences and is now resident in Darwin. She is working for the consultants Dames and Moore.

NEW SOUTH WALES

(Send your gossip to Dr Rod Oliver, MDFRC, PO Box 921, Albury NSW 2640.)

Terry Hillman has just returned from a conference on reservoir modelling in Czechoslovakia. This was followed by a short sojourn in Venice (presumably at the Commonwealth Writers Studio? - Eds) and a quick visit to Patrick Denny at Queen Mary College in England.

TASMANIA and SOUTH AUSTRALIA

To come in the next edition. Contact people for contributions are Alastair Richardson, University of Tasmania, and Lance Lloyd , Zoology Department, University of Adelaide.

WESTERN AUSTRALIA

(Razz the editors.)

David Gordon (of the Botany Department, U.W.A) returned to the University of Copenhagen in May to complete work he has been doing with Kaj Sand-Jensen on photosynthesis and carbon preferences of marine and freshwater plants.

Rod Lukatelich (Botany, U.W.A) and Brenton Knott (Zoology, U.W.A) will be visiting Prince Songkla University, Thailand, in August to discuss collaborative research on aquatic weeds.

Antonio Philomena is visiting the Centre for Water Research (Botany Department) between 28 October-11 November to discuss his work on Patos Lagoon in Brazil. He is presently doing a PhD at the University of Georgia with Bill Wiebe.

David Gordon and Jane Chambers have just completed a preliminary survey of botanical ponds created by sand mining at Capel. Researchers from the Zoology Department and the Centre for Water Research at UWA, the RAOU and the School of Biology at Curtin University have collaborated in this study and the owners of the ponds, Associated Minerals Consolidated, are keen to rehabilitate them. Don Edward and Dave Cale will be submitting a preliminary faunal report in August.

The book on wetland conservation which resulted from a workshop in February 1986 is now in press with Surrey Beatty, Sydney. The co-editors are Arthur McComb and Sam Lake.

Visitors to the Centre of Water Research have included Dr Mark Chutter, Dr Allan Twinch, Dr Colin Reynolds, Dr Rod Oliver and Professor B.R. Allanson. Professor John Melack and Dr Sally MacIntyre (both from University of California at Santa Barbara) will be visiting from July 1987 until January 1988.

Stuart Bunn is currently post-docing with Noel Hynes in Canada. He will return to UWA Zoology for six months in early 1988 to thaw out.

Peter Davies started his PhD in February. The subject is "The Importance of Autotrophy and Heterotrophy to Community Function in Northern Jarrah Forrest Streams". The research is AWRAC funded and supervised by Don Edward.

Sam Lake visited the Zoology Department at UWA and gave a talk on the effects of disturbance on benthic communities in streams on July 27, followed by a visit to the School.of Environmental and Life Sciences at Murdoch University on the 28th.

The macroinvertebrate community structure studies being carried out by Andrew Storey and Don Edward and their team for the Water Authority of W.A. continue apace. Sampling ends in December and reports will be submitted in June 1988.

Jenny Davis of Murdoch University, attended the 1987 NABS meeting in Orono Maine in early June and presented a paper on the flow microenvironments of stream benthos. En-route Jenny spent several enjoyable (but jet-lagged) days with Noel and Mary Hynes and Stuart Bunn in Waterloo. Stuart also attended the NABS meeting and presented a paper on life-histories of W.A. stream insects. Both It was an extremely stimulating meeting and well worth the effort (and expense!) required to attend, but "regulars" to NABS commented that the meeting lacked some of the "controversy" seen at NABS in recent years.

Limnological work on macroinvertebrates continues at Murdoch with both stream and wetland ecology projects being undertaken by Jenny Davis, Leon Barmuta, Steve Rolls, Shirley Balla, Sue Harrington, Adrian Pinder, and Mark Lund. The studies are supported by three State Government agencies, the Water Authority, the EPA, and CALM. Jenny Davis, Leon Barmuta, and Mike Van Keulen have just started on an AWRAC funded project to describe nearbed stream flows.

Professor Ian Potter and his estuarine research team are continuing to study a variety of projects including the effects of acid water on the ecology of the Collie River, the fish and fisheries of the Wilson Inlet and Nornalup Estuary, food availablity and resource partitioning in shallow water estuarine fish communities, and the biology of the Western King and Western School prawns in the Peel-Harvey Estuary.

Tim Wrigley and Goen Ho of Murdoch's Environmental Science programme are currently undertaking a joint study with Bob Humphries of the EPA on the fate and sources of nutrients in North Lake.

BOOK REVIEW

"INLAND WATERS OF NEW ZEALAND"
[DSIR Bulletin 241] (Ed. A.B. Viner) Science Information Publishing Centre DSIR, Wellington. 494 + ix pp. 1987. Cost: NZ $136
Available from The Publications Officer, Science Information Publishing Centre, DSIR, PO Box 9741, Wellington, New Zealand.
Reviewed by Ian Bayly,
Zoology Department, Monash University, Clayton, Vic., 3168.

This is a book of which the editor (A.B. Viner), the contributors, and New Zealand limnologists in general may be justly proud. Despite the fact that it did not, as intended, appear in time for the SIL Conference in Hamilton in February 1987, it clearly puts New Zealand limnology on the map in a cosmopolitan sense. An earlier (1975) book entitled "New Zealand Lakes" (edited by the late V.H. Jolly and J.M.A. Brown) was in some respects disappointing (quite apart from the fact that it obviously omitted running waters). In part, this may have resulted from its publication a little bit too soon in the history of New Zealand limnology - so much has been accomplished in the past 12 years. It is pointed out in the preface that the majority of people who have studied New Zealand inland waters are alive now, and most of them are no more than about halfway through their professional lives.

In his preface, Tony Viner makes it clear that there was no attempt in this book to make a comprehensive review of all limnological work done in New Zealand. Instead, a limited number of themes were judiciously selected. A majority of these permit broad comparisons to be made with other parts of the world and will doubtless claim the attention of foreign limnologists.

Chapter 1 (Origins and development of the lakes) together with its remarkably convenient and useful Appendices A and B (morphometric parameters) show great strength where, on the Australian scene, there is an almost total weakness. Here we have an excellent comprehensive account and logical grouping of New Zealand lakes according to their origin. (Having walked into the Ahukawakawa Swamp on Mount Egmont on more than one occasin, and thinking that within the limnological fraternity it was a locality that was more or less secret to me, I was amazed to find it listed in the Index and mentioned as being of probably phytogenic origin!) It is interesting that a biologist (J.D. Green) should have gone outside his normal field to combine with a geologist (D.J. Lowe) with such excellent effect. In Australia, the physical and morphometric exploration of lakes is characterised by much

neglect and disinterest at both the State and Commonwealth levels - so much so that I cannot see the Australian equivalent to this chapter being produced within my working life (I realise, of course, the difference in the areas of the two countries, but there are far more lakes per unit area in New Zealand than in Australia). In my book with Bill Williams I referred to the excellent series of bathymetric maps for the major lakes in New Zealand prepared by the New Zealand Marine Department and commented "Unfortunately nothing comparable has been undertaken in Australia; nor is it likely to be, so it seems, for a long time". That was published in 1973!

Chapter 2 (The effect of climate on lake mixing patterns and temperatures) is illuminating and rigorous in approach. It uses a sound knowledge of the morphology and thermal behaviour of New Zealand lakes to good advantage.

Chapter 3 (Regional influences on lake water chemistry) uses major ion chemistry as a basis for the regional grouping of lakes. It emphasises the unusual chemistry of lakes in the Taupo Volcanic Zone, many of which are strongly influenced by geothermal waters.

Part 2 of the book is devoted to rivers and consists of three chapters (4-6). The hydrology of New Zealand rivers is vastly different to that of those on the Australian mainland, reflecting in part the generally steep and feeble gradients in drainage systems of the two countries respectively. New Zealand's abundant rainfall and mountainous terrain result in numerous shallow, swift and boulder-strewn rivers; cobble-bedded braided rivers predominate in the South Island and eastern North Island. A chapter on the "Nitrogen, phosphorus and oxygen dynamics in rivers" pays particular attention to pastoral farming and associated processing industries as sources of organic material and nutrients to lotic environments. Chapter 6 (on the invertebrate communities of running waters) examines species composition, life histories, drift, functional feeding groups, and describes the communities of seven distinct types of stream. It concludes that the distinctive features of New Zealand streams include their unique taxonomic composition and prevalence of species with poorly synchronised life histories, long emergence periods and collector-browser feeding habits, and a fish fauna consisting entirely of carnivorous species.

In my review (ASL Newsletter, Vol. 14, No. 3, 1977) of "New Zealand Lakes" I commented: "It would be interesting to know what the curve for the zooplankton of 'a cool temperate lake' (Fig. 15-7) is based on. With its well-marked spring and autumnal peaks, it

looks suspiciously like the 'classical' curve of phytoplankton (population) density which Hutchinson (1967) regards as an extrapolation from oceanography which has only limited value for lakes". Chapter 7 (Phytoplankton growth) of the new book (although strictly one trophic level removed in subject matter) shows that my scepticism concerning alleged zooplankton growth patterns was well founded. When one looks at Fig. 3 (Seasonal chlorophyll-a changes in various New Zealand lakes) it is clear that most of the 18 lakes featuring in this illustration fail to conform with the older graph. Indeed, Lake Taupo, the largest lake in New Zealand, with its well developed late winter peak and autumnal minimum, behaves in almost a reciprocal manner to that decreed by the typical textbook graph of phytoplankton seasonal growth. It is concluded in the synthesis for Chapter 7 that, considering its small area, New Zealand's lakes exhibit an especially large variety of timing of phytoplankton growth responses during the annual cycle. A springtime peak of biomass is not a distinctive characteristic of New Zealand waters.

The chapter (8) on zooplankton ecology is an excellent synthesis and develops several themes of broad interest. I have only minor quibbles. In discussing Maly's alternative explanation of Hutchinson's size ratio (the so called 1:1.35 "rule") for co-occurring calanoid copepods the authors refer (p. 232 and in the caption to Fig. 3) to "interbreeding". However, Maly was talking about interspecific copulation mistakes and wastage of sperm - not about interspecific breeding. [Incidentally, I am somewhat skeptical about Maly's interpretations because of the rather artificial conditions (including abnormally high population densities) under which his experiments were performed. I also doubt whether the extraordinary specificity observed in calanoid secondary sexual structures is normally meaningless and functionless which Maly's interpretations seem to imply.] The authors' statement that "There is no indication that *C.[Calamoecia] lucasi* can produce resting eggs and it does not appear to occur in temporary ponds" may be true of this species in New Zealand. However, there is evidence to the contrary for populations of this species occurring in desert areas of Western Australia.

A section on zoogeography contains two chapters: the invertebrates and the native fish. It is pleasing to see that the authors of both chapters have not been intimidated by the strident dogmatism of Nelson and Rosen *et al.* that vicariance is the be all and end all of biogeography. While not denying the great importance of vicariance, these authors make clear their belief that dispersal may play a significant role in biogeographical phenomena. For

example, the West Wind Drift has very probably played a role in the dispersal of some forms from Australia to New Zealand. I agree with McDowall's statement (p.292) that "dispersal is clearly playing a role in New Zealand biota today". I note also the following statement in a recent paper by Ball: "the practising biogeographer must retain a pluralistic.... approach to his [or her] subject matter, if only because of the diversity of phenomena causing the distribution patterns with which he [she] deals. The idea that such a pluralistic approach represents some weak compromise must be rejected; it is a reflection of the way things are!" Of the two chapters, I believe that the task for the authors of "The Invertebrates" was considerably more difficult than that of the author of "The Native Fish"; the diversity of taxa and phenomena involved was much greater for the former. A minor point is that line 4 on page 283 should read "*B.tanea* is very closely allied to *B. propinqua* [not *triarticulata*]". Thecorrected statement then comes into line with that seven lines from the bottom of page 226.

The first of two chapters on ecological invasions, chapter 11, deals with the spectacular invasions by adventive macrophyte species experienced during the past century by New Zealand lakes and rivers. Serious studies of adventive macrophytes began only in the 1960s when these plants created problems in the Rotorua lakes and in the Waikato River hydro-electric reservoirs. Initially there was a tendency to assume that invasion by aquatic weeds was a consequence of eutrophication, but it now appears that there is no direct relationship between nutrient levels and macrophyte invasions. It is interesting that although invasion of streams running through pastoral country follows disturbance of native vegetation, invasion of lakes may occur without disturbance occurring in advance.

The second chapter (12) on ecological invasion examines the impact of exotic fishes on the native fauna. Intensive introductions, mainly of salmonids, began in the 1860s and lasted for 50 years. Until recently dispersal and liberation of exotics has occurred with little regard for impacts on native fish. Indeed concern was sometimes reversed and the author of the chapter quotes a renowned hydrobiologist as follows: "it seems unlikely that the kokopu [*Galaxias fasciatus* ?] is sufficiently abundant anywhere in the system [Horokiwi Stream] to have any influence on the trout population"!

Geothermally influenced waters represent one of the most distinctive aspects of New Zealand limnology and are the subject of an excellent account in chapter 13. Some microbes thrive in these

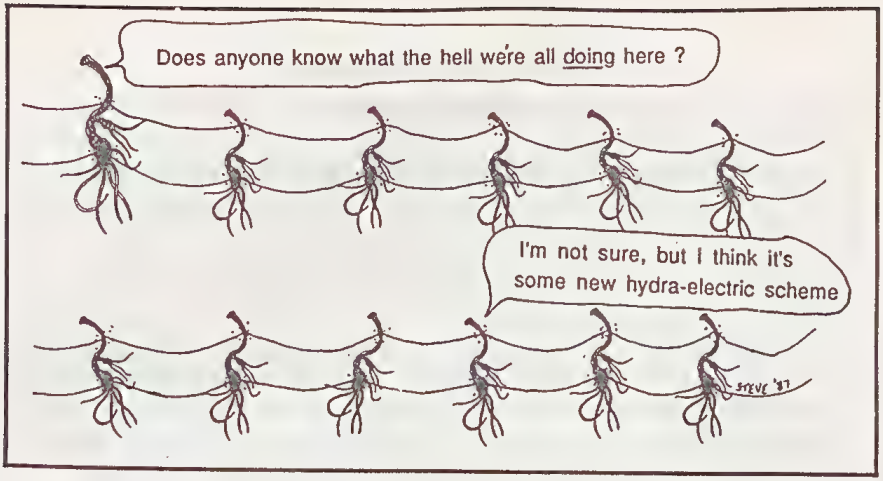
environments and New Zealand geothermal ecosystems represent a rich source of organisms with exceptional metabolic and enzymatic properties of scientific and commercial interest. Some archaebacteria isolated from New Zealand hot springs tolerate temperatures in excess of 80 °C. The Thermophile and Microbial Biochemistry Unit of the University of Waikato specialises in the science and biotechnology ofthermophilic bacteria. The high stability of enzymes derived from these organisms may be used to advantage in some manufacturing processes.

If anyone thought that Antarctic limnology was characterised by a drab sameness, that person will be in for a big surprise on reading chapter 14. Perhaps the most striking feature to emerge from this lengthy chapter is the great diversity amongst the 12 standing water and two running water systems that are considered in detail.

The final section deals with the influence of man and contains two chapters the first of which discusses sports fisheries. The most important species for recreational fishing are brown trout, rainbow trout and quinnat salmon. Salmonids can maintain breeding populations throughout most of the country south of 37 °C. Management problems, economic aspects and ecological factors distinctive of New Zealand are all considered. The final chapter (16) is an account of the use of water resources. After a review of these resources, Figure 2 ("A brief history of New Zealand and social change as it relates to water and soil") provides a very clever and informative summary of the more potent factors that have induced change. The chapter concludes with a discussion of legislation and management.

I recommend this book strongly to ASL members; there is a good case for having a copy sitting on your shelves next to "Limnology in Australia" (1986). These are two very different types of book, but I believe that both will serve us well in this part of the world for the next decade. The New Zealand book is more expensive but this is perhaps justified by its inclusion of 14 excellent colour plates.

From the point of view of university undergraduate students (say third year level) the New Zealand book would be rather more useful than the Australian one because of its more integrated approach. That comment goes for Australian as well as New Zealand students.

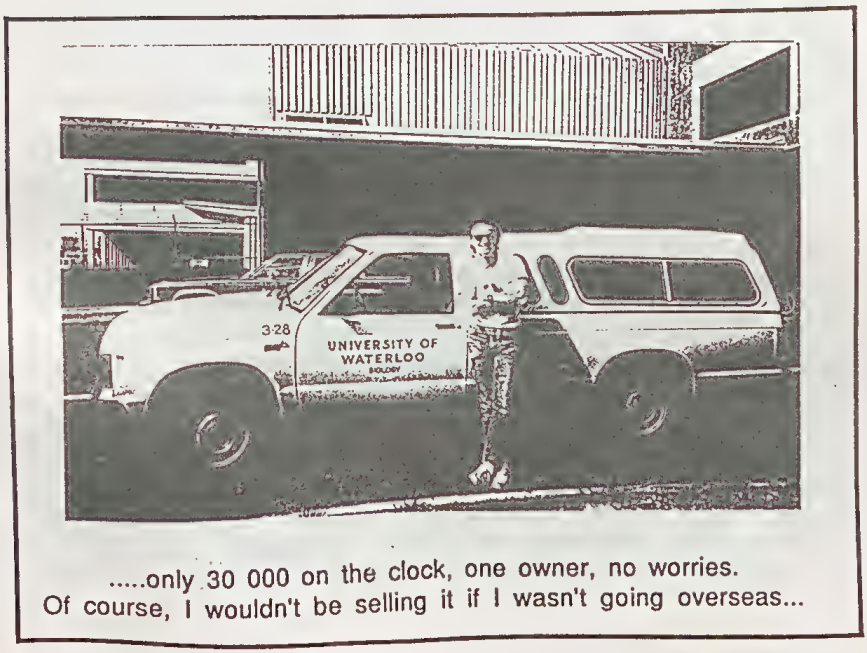


Thought for the day

....on rivers

Most rivers, if left completely to their own devices will develop qualities that are at best inconvenient to man and his activities, and at worst a threat to life and property

Henderson "Open Channel Flow" (1966)



.....only 30 000 on the clock, one owner, no worries.
Of course, I wouldn't be selling it if I wasn't going overseas...

SALINE POOLS IN THE WIMMERA RIVER, VICTORIA - SOURCE, DISTRIBUTION, STABILITY AND ENVIRONMENTAL CONSEQUENCES

Dr John Anderson, Kaiela Fisheries Research Station, Shepparton, Victoria.

A 12 month study of fish habitat in the Wimmera River, Victoria, was initiated to examine options for, and benefits produced by proposed environmental flows. Salinities in excess of 50,000 Siem/cm occur in the lower waters forming a distinct halocline. These saline pools occur throughout the middle reaches in the vicinity of Horsham. The density stratification is highly stable in deeper waters and only major flood events provide sufficient turbulence to mix the surface and bottom layers. Conductivities from 5,000 - 40,000 Siem/cm were measured in the deeper pools. The salinity stratification produced prolonged severe deoxygenation in the saline bottom waters, rending large areas unsuitable for aerobic aquastic life. Temperature profiles and chemical analyses suggest that the saline water is derived from localised groundwater intrusions. Temperature stratification and long periods of low flow during summer produce an intermediate third layer which may also remain hypoxic for prolonged periods. An experimental release showed that a small continuous flow considerably improved the dissolved oxygen levels in the upper two layers but had no effect on the saline bottom layer. Further work is required to positively identify the source of the saline water and to rectify the environmental degradation.

THE POSSIBLE EFFECTS OF PEAT MINING ON AQUATIC INVERTEBRATES IN THE LAKE MUIR WETLANDS, WESTERN AUSTRALIA

Maureen DeHaan, School of Environmental and Life Sciences, Murdoch University, Western Australia

Small scale dry peat mining operations can have a significant environmental impact on peatland ecosystems. At present, peat mining operations are proposed for the Lake Muir Wetlands. These wetlands are part of a nature reserve which contains six new species of aquatic water mites. This study investigated the present aquatic invertebrate community structure in the Lake Muir wetlands and reviewed the relevant literature to determine the possible effects of peatmining on those invertebrates.

Three fen peatlands near Manjimup (Poorginup, Tordit Gurrup and Byenup) were sampled in December 1985 and April 1986 to determine their water chemistry and all three wetlands were found to be freshwater (0.1-7.0%d), circumneutral (pH5-8) and mesoeutrophic. A total of 103 species of aquatic invertebrates were recorded with only eight species being common between the three wetlands. Indices of similarity demonstrated a definite dissimilarity between the three wetlands based on species richness. The class Insecta dominate the invertebrate fauna, accounting for 72% of the total number of species recorded. Species diversity was higher in the Lake Muir wetlands compared to Western Australian urban wetlands, but similar in evenness. Based on the literature reviewed there are numerous environmental impacts associated with the various stages of peat mining. The stages identified as most detrimental to aquatic invertebrates are the clearing and draining of the peatland. This loss of habitat along with potential changes in physico-chemical conditions may result in a change to the aquatic invertebrate community structure.

A NEW METHOD FOR INVESTIGATING THE PROPERTIES OF HUMIC SUBSTANCES: FLOW FIELD-FLOW FRACTIONATION

Ron Beckett, Water Studies Centre, Chisholm Institute of Technology

A new method for determining the molecular weight distributions of humic substances will be described. Not only does the method promise to yield more reliable and comprehensive MW information than other traditional methods, it provides a method for monitoring the degree of association of these molecules under different environmental conditions (pH, ionicconcentrations). It is postulated that this aggregation will markedly affect other properties of humics such as their binding of pollutants and nutrients.

MACROINVERTEBRATE SUCCESSION IN AN INTERMITTENT STREAM

A.J. Boulton, Zoology Department, Monash University, Clayton, Victoria 3168

Macroinvertebrate succession was examined in pools and riffles at two sites along the Werribee River, an intermittent stream north-west of Melbourne. These sites differed in duration of flow and permanency of water over the study period, which included a drought year (1982) followed by a wetter year (1983-1984).

Ordination and classification were used to illustrate the different patterns of succession occurring in the pools and riffles. At one site succession in the riffle appeared to be a linear process, while a "cyclical" succession occurred in the pool disrupted by the complete drying up of the habitat during the drought. The drought eliminated several taxa that were extremely abundant in 1982 and this may have led to the different patterns of succession obtained in 1983-1984.

GONE WITH THE WIND? TWO CONTRASTING STUDIES IN HYPERTROPHY

Kathleen H. Bowmer, CSIRO Centre for Irrigation and Freshwater Research, Griffith, 2680

In two contrasting systems which were highly enriched with ammonium-nitrogen the objectives were opposite - to remove nitrogen or conserve it. Nitrogen removal was achieved by utilising the processes of nitrification and denitrification occurring in the root zone of aquatic macrophytes. Nitrogen conservation was achieved by reducing algal photosynthesis in shallow water.
Papers in press: *Bowmer, K.H. Nutrient removal from effluents by an artificial wetland: influence of rhizosphere aeration and preferential flow studied using dye and tracers. Water Research.
*Bowmer, K.H. and Muirhead, W.A. Inhibition of algal photosynthesis to control pH and reduce ammonia volatilization. Fertilizer Research.

COMPARISONS BETWEEN RIVER MURRAY BILLABONGS BASED ON NUTRIENT COMPOSITION OF THE SEDIMENTS

Mark Brymner, Murray-Darling Freshwater Research Centre, Albury-Wodonga

Three billabongs on the River Murray floodplain near Albury-Wodonga were investigated by studying the spatial and depth-wise variation in nutrient composition of the sediments. For each billabong, significant differences were found between sites for most parameters, but the differences with sediment depth were more inconsistent. Multiple regression analysis of the data from each billabong showed that they were significantly different from each other in sediment composition. The billabongs studied were generally different from other water bodies in sediment composition when all parameters were taken into account.

PHYTOPLANKTON IN A MEROMICTIC ANTARCTIC LAKE - ANNUAL CYCLE OF GROWTH AND ADAPTATION STRATEGIES

Michael D.Burch, Engineering and Water Supply Department

The annual cycle of the phytoplankton was studied in Ace Lake - a saline ice covered meromictic lake in the Vestfold Hills. The lake is permanently stratified with gradients of temperature, salinity and oxygen over its 23 metres depth. The phytoplankton consisted of only four species, all flagellates, and their annual cycle was one of active growth in spring and summer for a period of seven months and overwinter survival of a small number of cells. Spring growth commenced in September with increased light penetration into the lake, which was enhanced by the removal of snow from the ice surface.

The three dominant flagellate species displayed distinct vertical stratification over the euphotic and oxic zone (0-10 metres). This stratification was not static and developed over spring as the three populations migrated to preferred light climate zones, independent on both temperature and salinity. The phytoplankton modified the light climate within the lake by absorption of specific spectral components within their preferred light climate zones.

Two phytoplankton species showed significant variation in mean cell volume over the year. The algae had a minimum volume in winter and this progressively increased in spring to a maximum in summer. Mean cell volume was positively correlated to light intensity (maximum ambient PAR) at depth of sample.

THE STATUS OF MACQUARIE PERCH IN N.S.W.

J.J. Burchmore, Fisheries Research Institute,
N.S.W. Department of Agriculture

The Macquarie perch, *Macquaria australasica*, was once widely distributed in the Murray-Darling and south-east coastal drainages of Australia. In recent times it has suffered a severe decline in its distributional range and abundance. Fisheries authorities in both NSW and Victoria are currently undertaking breeding programmes in an attempt to conserve the species.

In NSW, Macquarie perch is found in both inland and coastal drainages and it was thought that the coastal populations represented historical translocations of inland stock. This paper outlines the current status of Macquarie perch in NSW with particular emphasis on the populations in the Shoalhaven and

Hawkesbury systems (coastal) and the Lachlan and Murrumbidgee systems (inland). Recent systematic studies of these populations have suggested that there are at least three distinct stocks in the State, one inland and two coastal.
The implications for future breeding and restocking programmes are discussed as well as the complex problems now being faced by fisheries managers in attempting to conserve this species.

DESTRATIFYING BOU REGREG RESERVOIR, MOROCCO

Frank L. Burns, Consulting Engineer, Glen Waverley, Vic.

In August 1986, the author was asked by the World Health Organisation to visit Morocco and advise on destratification of the 500,000 ML Bou Regreg Reservoir. This reservoir, built in 1974, supplies about 3 million people in Rabat and Casablanca with fully treated water (Degrémont treatment plant). However, the reservoir stratifies strongly each summer, with temperatures of 28 deg C at the surface and 12 deg C at the bottom (35 m depth). The resulting oxygen depletion in the cold stagnant water below the thermocline (10 m depth) leads to generation of hydrogen sulphide, which is difficult and expensive to remove at the treatment works. Blue-green algal blooms in the water above the thermocline render the expensive multi-level outlet tower of little use in solving the problem.
A low cost electric powered fully automatic air bubbling installation, similar to those operating successfully in several Victorian lakes and reservoirs, was designed. The estimated capital cost of $A30,000, and annual operating cost of $A4,000, for this reservoir management, was considerably less than attempting to solve the problem at the water treatment works.
The presentation will describe the problems in the reservoir, the solution recommended, and the interesting experience of applying our Australian limnological experience to an environment with a history going back to pre-Roman days.

PHOSPHORUS UPTAKE BY WETLAND MICROSYSTEMS AT DIFFERENT PHOSPHATE CONCENTRATIONS AND FLOW RATES

Jane M. Chambers, Department of Botany and Centre for Water Research, University of Western Australia, Nedlands, WA ,6009

Wetland microsystems, consisting of PVC chambers of 0.5 m^2 area filled with sand or peat and planted with the sedge *Lepidosperma longitudinale* were used to study phosphorus uptake at a range of phosphate concentrations and flow rates. Microsystem treatments ranged from flow rates of 1-400 l m^{-2} wetland d^{-1} and phosphate concentrations of 0.5-10 mg l^{-1} to give comparable phosphorus loads of 200, 100, 50, 20 and 10 mg P m^{-2} wetland d^{-1}. Using dye tracers, the residence times of water within the wetland were calculated to vary between 1 and 70 days.

Nutrient concentrations of orthophosphate, total phosphorus, total nitrogen, nitrate/nitrite and ammonia of outflow water were measured over time, and at the end of the experiment, the plants, sediment and water were harvested, weighed and analysed for total phosphorus and nitrogen to determine how these nutrients were partitioned in the wetland microsystem.

Variations of flow rate and phosphorus concentration appeared to have little affect on the efficiency of the microsystem to take up phosphorus within the same phosphorus loading. However with increasing load, the percentage of phosphorus taken up decreased from about 93-96% at less than 50 mg P d^{-1} to around 74% at 200 mg P d^{-1}. At high flow rates and low phosphorus concentrations plant biomass was much greater and a larger proortion of the phosphorus was found in the plant biomass at the end of the experiment. At low flow rates and high phosphorus concentrations the sediment was the larger store. This may be an important factor in the continued efficiency of the microsystems to uptake phosphorus.

APPLIED PALAEOLIMNOLOGY : BURRINJUCK RESERVOIR, N.S.W.

R.L. Clark and R.J. Wasson,
CSIRO Division of Water and Land Resources, Canberra

Palaeoecological and geomorphological techniques are being used to complement and extend the historical and instrumental record of Burrinjuck Reservoir and its catchment. The physical and chemical properties of the reservoir sediments and their biological inclusions, indicate changes over time in terrestrial and aquatic

ecosystems as well as in sources of sediment. These changes can be related to changes in climate, vegetation, soils and land use to provide a record of long-term trends and rare events, of the most important events in terms of water quality, and of antecedent conditions for major events. The information thus obtained about long-term interactions of processes provides a sound basis for catchment and reservoir management. Such research would be greatly enhanced by short-term monitoring and all short-term monitoring should be accompanied by reconstructions of the past so that the results can be interpreted in the context of longer-term change or stability and some appreciation gained of how typical or atypical the monitoring period is.

INTERANNUAL VARIABILITY IN CHEMICAL AND BIOLOGICAL OBSERVATIONS IN STORM BAY, TASMANIA

Lesley Clementson, CSIRO Division of Fisheries Research, Hobart

Storm Bay is located in the south-east of Tasmania adjacent to the mouth of the Derwent River and is the site of a weekly sampling programme for several chemical and biological parameters. This study started in March 1985 and is still continuing.

Results from the first two years will be presented and relationships between inorganic and organic nutrients, chlorophyll, zooplankton biomass and larval fish abundance will be discussed.

PREDATOR-PREY INTERACTIONS IN AN INTERMITTENT STREAM

Gerard Closs, Zoology Department,
Monash University, Clayton, Victoria, 3168

Communities that are partly or largely structured by the interaction between predators and their prey have been shown to exist in marine benthic and lentic plankton communities. A single predator species can play a fundamental role in maintaining the community structure and its removal results in significant community alterations.

However, despite a number of studies, evidence for strong predator-prey interactions that maintain community structure is sparse for stream benthic communities. The high degree of environmental heterogeneity, both structural and temporal, often found in such habitats, may well act to reduce the intensity of predator-prey interactions.

Following a review of the topic, I will present some preliminary results and observations of work on benthic communities in the Lerderberg River, an intermittent stream near Melbourne. During the summer low-flow period there appears to be a potential for the development of strong predator-prey interactions.

THE MACROINVERTEBRATE FAUNA OF THE STREAMS OF THE GEORGE GILL RANGE, CENTRAL AUSTRALIA - RELICT COMMUNITIES FROM AUSTRALIA'S WETTER PAST?

J.A. Davis, S.A. Harrington and J.A. Friend, School of Environmental and Life Sciences, Murdoch University, Murdoch W.A.

The George Gill Range, 220 km south-west of Alice Springs, lies within one of the driest regions of Australia. The average rainfall is approx. 250 mm per annum but is non-seasonal and in some years no rain falls. Despite the aridity of the area, there is much freshwater in central Australia, mainly within the gorges of the range country, such as those of the MacDonnell Ranges near Alice Springs. The waters of the George Gill Range, however, are of special interest because of their relatively pristine nature. Nutrient enrichment, primarily a result of the impact of cattle, camels, horses and donkeys, has resulted in excessive algal growth and poor water quality in many central Australian waterbodies. However, the rugged and inaccessible nature of much of the George Gill Range has preserved some small aquatic ecosystems in a relatively unaltered state.

The objective of this study was to determine the composition of the macroinvertebrate communities of the streams of the George Gill Range and to determine the relationship of the fauna of these communities to those of waterbodies elsewhere in Australia. To do this the macroinvertebrate fauna of the Range was sampled semi-quantitatively (20 second sweep net samples) in July 1986 and January 1987.

The dominant fauna of the Range, in terms of species richness, is the Insecta, whilst the crustacean fauna, apart from ostracods and copepods, is poor. The fauna comprises a number of species including the waterpenny, *Sterocyphon fuscus*, and the simuliid, *Simulium ornatipes*, which also occur in southern and eastern Australia. Because of their low mobility these species would not be capable of dispersal across the large tracts of arid land that now separate the Range from coastal areas. These disjunct distributions suggest that some of the fauna of the George Gill Range has arisen from species that were once widespread across Australia, probably

in the early Tertiary, when the Australian continent was much wetter than it is today.

FACTORS INFLUENCING THE ADSORPTION OF DISSOLVED ORGANIC MATTER ONTO GOETHITE

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Water Studies Centre, Chisholm Institute of Technology,
PO Box 197, Caulfield East Vic. 3145

It is now well accepted that the surface of suspended particulate matter (SPM) in aquatic systems is coated with organic matter and that this coating has a profound influence on the ability of this SPM to take up trace metals and toxic organic pollutants from the water column.
However, there is a lack of information on the factors influencing the coating of solid surfaces in natural waters.
A series of experiments were undertaken to examine the influence of pH and ionic strength on the adsorption of natural organic matter onto goethite. The DOM was isolated from Red Water Creek. The DOM was also fractionated, using XAD resins, into hydrophobic and hydrophillic fractions. The adsorption of each fraction onto goethite was investigated.

ON THE EXCITING DISCOVERY OF DOLOMITE IN VICTORIAN LAKES

De Deckker, Patrick - Geography Department, Monash University,
Clayton, Vic., 3168, and Last, Bill- Geological Sciences,
University of Manitoba, Canada, R3T 2N2

During a reconnaissance survey of saline lakes scattered throughout the Volcanis District in south western Victoria, our attention was drawn by the very turbid waters, with an obvious "milky" appearance, in a number of shallow playa lakes. Analyses of surficial lake sediments, and of residual material left over 0.45 um filters after filtering lake waters, all from several lakes commonly consisted of protodolomite, and in some cases magnesite. Aragonite was absent from those samples and, commonly, calcite was in trace proportions. On examination under the SEM, the protodolomite mud consists of small (0.5-3 um) ill-defined rhombs arranged in aggregates. X-ray diffraction patterns of all samples studied indicate that all the dolomites are disordered (hence they are called protodolomites) and their range is 47-52 mole% $CaCO_3$.

With the help of Wiliams and Buckney's water analyses gathered for five of the dolomite lakes over a four year period, we have been able to come up with some generalisations about conditions which affect and control the deposition of dolomite. To reach some of our conclusions we used the WATSPEC programme which calculates the equilibrium conditions of the waters with respect to a variety of mineral species. This exercise also helped explain why for example gastropods and ostracods are usually absent from those lakes.

RECOLONISATION OF MACROINVERTEBRATES IN DISTURBED STREAM SUBSTRATA

Timothy.J. Doeg, Zoology Department Monash University, Department of Environmental Records, Museum of Victoria

Small patches of stream substratum (ca. 1 sq.m.) were manually disturbed by kicking and raking. The colonisation of macroinvertebrates was followed over 71 days. Compared with contiguous, undisturbed patches, the disturbance resulted in a drop of 75% in organic detritus, 66% in total number of species per sample and over 80% in the number of individuals per sample. Detritus and number of species per sample rose rapidly, reaching equivalence with undisturbed patches after 10-21 days. The number of individuals per sample rose less rapidly, reaching equivalence 35-71 days after disturbance. This was mainly due to the slow return of Chironomidae individuals (the most abundant component of the fauna).

Comparison of colonisation rates in erosional (rocky beds) and depositional (sandy beds) are planned, testing the hypothesis that more frequently disturbed substrata should contain more resilient fauna. Experimental multiple "disturbasms" are also planned.

LIMNOLOGY OF LARVAL FISH PONDS

M.C. Geddes, Department of Zoology, University of Adelaide

At the Inland Fisheries Research Station, Narrandera, native fish larvae and fry are successfully raised in ponds that are managed to promote survival and growth of the fish. Variability in fish survival and growth probably relates to limnological features of the ponds, such as variation in water quality, algal growth and zooplankton population dynamics and to variation in the number and species of fish in the ponds. Four ponds, two stocked with golden perch (final densities 3.7 and 5.3 m^{-2}) and two with silver perch (5.7 and

14.1m^{-2}), were studied. In all ponds an initial mixed algal bloom was followed by a much larger blue-green (mainly *Anabaena*) bloom, which crashed by about day 30. In all ponds zooplankton succession was from rotifers to *Moina-Boeckella* to *Daphnia-Boeckella*. Golden perch predation appeared to suppress *Boeckella* while silver perch predation may have suppressed *Moina* and *Daphnia*. Limited availability of suitable plankton at first feed probably influenced fish survival while growth appeared not to be limited by prey availability at fish densities up to 14 m^{-2} at harvest.

ASSESSING CONSERVATION VALUE OF WETLANDS

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We have used data collected by the Royal Australasian Ornithologists' Union and by Department of Conservation and Land Management staff to examine: (1) how various characteristics of a wetland affect the numbers of waterbirds using it; (2) habitat preferences of particular species; (3) whether lakes can be classified in a biologically meaningful way. Using discriminant function analysis, we can predict with about 80% accuracy whether certain species occur in sites possessing particular physical characteristics and, using various clustering techniques, have produced wetland classifications that are meaningful in terms of waterbird usage. Although 80%-accurate predictions about waterbird usage of a site can be made on the basis of its physical characteristics, this does not replace the need for faunal surveys : better predictions can be made with some knowledge of the waterbirds present. For example, using data on other waterbird species breeding there discriminant function analysis can usually predict whether a species breeds at a site with over 90% accuracy. From a management viewpoint it is important to discover whether the 10% error in prediction is a mistake in the analysis or the result of less than optimal use of habitat by waterbirds.

The information we have collated on waterbirds will be extensively used in formulating management policies for wetlands in Western Australia. It is vital that similar projects are undertaken for aquatic invertebrates and plants in the near future in Western Australia and elsewhere so that the ready availability of synthesised information on waterbirds does not result in wetlands being effectively managed only for this group of animals.

CONSERVING AUSTRALIA'S THREATENED FISHES

John H. Harris, Fisheries Research Institute, NSW

Recent concern over threats to Australian fishes led the Australian Society for Fish Biology to respond by providing an authoritative up-to-date analysis and classification of the status of the fish fauna. This culminated in August 1985 in the Society's Conference on Australian Threatened Fishes.

A seven-stage scheme of classification was designed by the conference, and 62 species were listed. The classifications were "Extinct" (0 species), "Endangered" (4), "Vulnerable" (4), "Potentially Threatened" (5), "Indeterminate" (2), "Restricted" (32) and "Uncertain Status" (15+).

In the process of classifying the fauna a variety of causes of fish conservation problems were identified. These included the highly localised distributions of some species, interactions with introduced or translocated species, fishing pressure, and lack of knowledge of the fauna. Predictably, however, environmental degradation was recognised as the greatest factor leading to declines in fish abundance and distribution.

ALLEGORICAL WATER MITE TALES

Mark S. Harvey, Environmental Records Section, Museum of Victoria, 71 Victoria Crescent, Abbotsford, Vic. 3067

A brief annotated, somewhat allegorical, account of basic water mite morphology is presented, along with highlights of structures deemed to be taxonomically important. Plans are outlined for a proposed pictorial key to the water mite genera of Australia.

THE LONGITUDINAL ZONATION AND ECOLOGY OF INVERTEBRATES IN A CANADIAN COLDWATER SPRING

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Spring faunas merit attention for several reasons, including the monitoring of groundwater quality. Unfortunately, little is known of spring faunas in Canada.

Valley Spring issues from a sandy hillside and runs 60 m, entering a tributary of Lake Ontario. Water temperature varies annually from

7 to 18 °C near the issue despite air temperatures of minus 16 to plus 41°C. Discharge also varies little.
The fauna consisted of 14 orders, encompassing 33 families and roughly 50 taxa, but was numerically dominated by the Diptera and the Plecoptera. Caddisflies, mites, amphipods and copepods were also important. Most are typically spring inhabitants. A zonation of the fauna exists with some species, for example, the caddisfly *Parapsyche apicalas* and mite *Mucronothrus nasalis* more common near the issue.
Most inhabitants studied appear to be univoltine (one generation/year) such as the stonefly *Nemoura trispinosa* and the caddisfly *Diplectrona modesta*. Nymphs of *N.trispinosa* were found to be significantly larger downstream, five months after oviposition, and completed their life cycle one month earlier than upstream animals.
This study suggests the need for additional information on Canadian springs. An accurate assessment of food webs, and the effects of temperature, would allow greater insight into factors responsible for zonation. This, together with a comprehensive regional analysis of spring faunas, would be essential for the successful monitoring of groundwater quality.

FEEDING RESPONSES IN THREE SPECIES OF AUSTRALIAN BLACKFLY LARVAE USING A LABORATORY STREAM SYSTEM

P.A. Horne Rural Water Commission of Victoria,
Water Quality Assessment Section

A three channel, fully independent, recirculating, laboratory stream system was constructed at the Rural Water Commission of Victoria. The system was designed to study the effects of physical variables such as water velocity, water temperature, substrate type and turbidity and their relative influence on selected rheophilous benthic macroinvertebrates.
The laboratory streams have been successfully used to study the responses of Australian blackfly larvae (Diptera; Simuliidae) to water velocity, water temperature (and dissolved oxygen), turbidity and an introduced toxicant. In addition, research in fluid mechanics involving flow visualisation techniques has been conducted.
This paper deals in general with the laboratory stream concept and specifically with feeding responses in three species of blackfly larvae (namely; *Austrosimulium furiosum, Simulium ornatipes* and *S.melatum*). A series of laboratory experiments were conducted which examined the type and size ranges of particulate food

sources accepted by the Simuliid larvae. Particles accepted as food ranged in size from colloidal to 50 um.
Food passage through the gut was also examined in relation to time, temperature and food density. It was observed that the rate of passage of the food plug through the gut increased markedly as temperature was increased, up to a maximum of 20 ^{o}C.

SYSTEMATICS AND SPECIATION IN THE FRESHWATER CRAYFISH GENUS *Engaues*

P. Horwitz, Zoology Department, University of Tasmania

A recent electrophoretic and morphological investigation into a large number of populations of freshwater crayfish belonging to the genus *Engaeus* has led to the recognition that the genus is far more diverse than previously understood.
The genus is characterised by high levels of regional endemism within south-eastern Australia, with 14 species being recognised from Tasmania and 22 species from Victoria, with only two species occurring in both regions.
A speciation model, based on the present day distributions of one species *Engaeus cunicularius* and incorporating the fluctuations of sea levels, is proposed and its applicability to other freshwater species is discussed.

THE EGGS OF *Tanytarsus barbitarsus* FREEMAN (DIPTERA: CHIRONOMIDAE)

M.J. Kokkinn, Faculty of Applied Science,
Warrnambool Institute of Advanced Education

The halobiont chironomid, *Tanytarsus barbitarsus* inhabits waters with salinities up to 100 g/l in eastern Australia. As part of a control-orientated research programme, an investigation of the following aspects of the egg biology were undertaken: anatomy, hatching and ionic regulation.
The eggs, which are laid individually, have featureless surfaces with a vestigial plastron surrounding the micropyle at the anterior end. They measure 0.21 by 0.11 mm, being elongated along one axis. A temperature/ hatching rate relationship is derived from hatching experiments. Submersion of the eggs in distilled water had no apparent influence upon hatching success. Silver staining techniques confirmed that all but late stage eggs are impermeable. A further experiment revealed the eggs to be intolerant of

desiccation. The experimental findings are used to deduce ion excretion patterns during the egg phase of *T. barbitarsis*.

MACROINVERTEBRATE SUCCESSION IN A TEMPORARY POND

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In 1978-79 a relatively large temporary pond was regularly sampled from shortly after filling (2/8/78) until shortly before drying up (21/2/79). Over all collections 91 species of macroinvertebrates were found with 70 species being insects [Coleoptera, Diptera, Hemiptera, Odonata being dominant orders]. Other groups found were Porifera, Annelida, crustacean and acarine Arthropoda, Mollusca and Amphibia. Strategies of pond utilisation by the animals will be outlined. Species richness rose rapidly and, in spite of a high rate of species turnover, achieved an early constancy. Multivariate Analysis (DECORANA and TWINSPAN) revealed three distinct phases of species change. The succession began and ended allogenically but had a marked autogenic middle period. From an initial fauna rich in detritivores the succession terminated in a seething puree rich in predators.

EFFECTS OF VEGETATION AND TURBIDITY ON THE REDUCTION OF CONSUMPTION OF *Aedes notoscriptus* (DIPTERA : CULICIDAE) BY *Gambusia affinis* AND *Anisops* spp.

D.J. Lambert and R.H. Norris, Water Research Centre,
CCAE, Belconnen, PO Box 1, Canberra ACT

Wetland ponds have the potential for developing populations of mosquitoes which can transmit diseases of major concern in Canberra, such as filariasis, polyanthistis and Australian encephalitis. Field observation showed *Aedes notoscriptus* (Diptera : Culicidae) to be the most abundant mosquito species found in Canberra wetlands. Also present were *Culex australicus, Culex annulirostris, Culex fatigans*, and *Anopheles annulipes* .These pests were most numerous in habitats which excluded predators. Laboratory experiments showed mean consumption of mosquito larvae per *Gambusia affinis* per 24 hours varied from 91.86 +/- 1.73 for pristine water to 55.93 +/- 19.28 for water with a turbidity of 500 ntu. The experiment also showed that the rate of consumption did not vary with the presence of vegetation at densities equivalent to those observed in the field. The potential

for vegetation to reduce predation is likely to occur only when the vegetation completely isolates the predators from the prey.

THE EFFECT OF RIVER REGULATION ON THE SMALL FISH DIVERSITY OF FLOODPLAIN HABITATS IN THE RIVER MURRAY, SOUTH AUSTRALIA

Lance Lloyd, River Murray Laboratory,
Department of Zoology, University of Adelaide

The small-fish fauna of the lower River Murray is examined in terms of its diversity (richness and Simpson's D), habitat types and relationship with river regulation. Four habitat types are recognised using an average linkage cluster analysis based on Sorensen's index of similarity involving five physical attributes (flow, connection to main channel, substratum type, turbudity and salinity). These are "river edge" environments (along with the edge of the main river channel), "backwaters" (slack waters connected to the main channel), "billabongs" (still waters isolated except during floods) and "streams" (small, flowing, tributary creeks). River edge habitats have the highest diversity (mean richness = 7.6; mean Simpson's D = 0.67). Backwaters (5.1; 0.56) and billabongs (3.5; 0.32) have lower diversity and the species present are a subset of those in river edge habitats. River edge habitats are more diverse because of the easy recolonisation of species. Backwaters and billabongs are less easily colonised and have an greater probability of local extinction. Streams also have a low diversity (2.6; 0.34), but their faunal composition is distinctive. The lower diversity of streams is probably due to the restricted nature of the habitat and their lack of direct connection to the river. However, without these stream assemblages the lower Murray fish fauna would be greatly reduced. Floodplain habitats (billabongs and backwaters) have become more isolated due to the decreased frequency of small floods resulting from river regulation. This increased isolation has resulted in decreased fish species diversity via extinctions, competition and predation.

WILD AND SCENIC RIVERS - A LIMNOLOGICALLY USEFUL CONCEPT?

Luisa Macmillan, Department of Planning
Policy and Landscape, RMIT, Melbourne

In recent years a number of countries have developed Wild and Scenic River Systems in response to calls for the conservation of riverine environments. With the Victorian Land Conservation Council about to commence a study of 'wild and scenic' rivers, it is pertinent that the concept come under scrutiny from limnologists. The U.S. System, upon which most other Wild and Scenic River Systems are modelled, is heavily skewed towards the protection of recreational and aesthetic values. From a limnological perspective the System suffers some fundamental deficiencies. In view of this, it is important that limnologists develop clear and systematic criteria for identifying rivers (and other aquatic habitats) which are of limnological significance and require a high level of protection. The Australian Society for Limnology could play an important role in developing such criteria.

STRATEGIES FOR LIMNOLOGICAL RESEARCH IN THE MURRAY-DARLING BASIN

David S. Mitchell, Murray-Darling Freshwater
Research Centre, Albury-Wodonga

The establishment of the Murray-Darling Freshwater Research Centre (MDFRC) provides both reason and opportunity to develop a cohesive strategy for the development of a programme of limnological research in the Murray-Darling Basin. The strategy must recognise the need to carry out research that will contribute to sustainable multipurpose management of water resources in the community's interests, both in the short-term and beyond into the next decade. Interdisciplinary, collaborative research that makes the most efficient use of available resources is essential. Within these constraints, however, there must also be a balance between the collection of basic data that characterise the systems and their responses to perturbation and research to elucidate the mechanisms within components of the systems and at the interfaces between these components.

Starting with the resources available and building on the current knowledge of the system, the MDFRC has developed a number of research projects within two research programmes: Limnology of the River Murray, and Ecology of the Floodplain. These offer many opportunities for collaborative research with other limnologists.

ENVIRONMENTAL EFFECTS OF RESIDENTIAL TIDAL CANALS

Peter M. Nuttall, Dandenong Valley Authority, Victoria

Residential tidal canal development in Australia has created over 200 waterways throughout Western Australia, New South Wales, South Australia, Victoria and Queensland. Initially an American concept, construction began in the subtropics during the 1950s as a means of extending the limited water frontage then available for real estate development. However, canals almost invariably exhibit water quality, hydraulic, biological and social problems not only along the channels, but also within the parent water body. Studies on tidal canals in Victoria illustrate the various problems experienced with these types of aquatic environments and assess strategies undertaken by managing organisations to combat such problems.

ECOLOGY OF WOOD DEBRIS IN LOWLAND STREAMS

Nick O'Connor, Zoology Department,
Monash University, Clayton, Victoria,3168

The Pranjip-Creightons Creek system is a fifth-order lowland tributary of the lower Goulburn River in northern Victoria. An interesting feature of this system is the large amounts of fallen wood present in lower reaches. This wood, which originates from riparian river red gum (*Eucalyptus camaldulensis*) probably has a considerable effect on the ecology of the stream. Following a review of the relevant literature, and my own field observations, I constructed an experiment aimed at elucidating the key features of submerged wood which may control the nature of invertebrate communities colonising it. In this presentation I shall discuss the design of the experiment, the sampling method, and some preliminary results.

OPTICAL PROPERTIES OF *Microcystis* COLONIES AND THEIR INFLUENCE ON LIGHT ATTENUATION

R.L. Oliver, Murray Darling Freshwater Research Centre, G.G. Ganf, University of Adelaide, and A.E. Walsby, University of Bristol, U.K.

Phytoplankton contribute to vertical light attenuation as a result of absorption by their photosynthetic pigments and light scattering by refractile components. To assess the effect of these organisms

on the underwater light climate requires measurements of their inherent optical properties.

Bloom forming cyanobacteria made buoyant with gas vacuoles can aggregate near or at the water surface, and as a result of intense scattering by the refractile gas vacuoles, may strongly influence the underwater light regime. Laboratory measurements were made on colonies of *Microcystis* collected from Mr Bold Reservoir to assess the contribution of their gas vacuoles to light scattering, and to determine the effect of colony size on chlorophyll specific coefficients of scattering (K_b) and absorption (K_a). Because of variation in gas vacuole volume, pigment content and colony size the values of K_b and K_a varied. However, mean values calculated from the laboratory measurements (K_b = 0.117 and K_a = 0.0054 mw mgchla^{-1}) were similar to field estimates. The contribution of *Microcystis* to light attenuation in the reservoir was assessed from these measurements and compared with the role of other suspended particulates and dissolved colour. The significance of the large scattering coefficient resulting from gas vacuoles is discussed in relation to the success of blue green algae in dominating certain waters.

THE USE OF STRUCTURAL DEFORMITIES IN CHIRONOMID LARVAE TO DETECT SUB-LETHAL LEVELS OF STRESS IN AQUATIC SYSTEMS

V. Pettigrove, Water Quality Assessment Section,
Rural Water Commission

Most monitoring projects of benthic macroinvertebrates investigate the dynamics of community structure to determine the river health of a system. Another approach is to investigate the degree of structural deformities in a species population to detect sub-lethal levels of stress.

During routine processing of samples collected as part of the River Murray Commission's Macroinvertebrate Programme, a number of larvae of the chironomid *P. paludicola* were found to have deformed ligulae. The possible causant(s) producing such deformities and the advantages and disadvantages of using such a technique will be discussed.

HIGH DENSITY PRODUCTION OF AUSTRALIAN ZOOPLANKTON

Bryan E. Pierce, River Murray Laboratory,
Department of Zoology, University of Adelaide

The ability to continuously culture large numbers of zooplankton in the laboratory would facilitate both limnological research (e.g. toxicity studies) and aquaculture (e.g. controlled first feeding of fish larvae). However, most captive populations crash regularly. A continuous flow system was developed which supported high densities of single zooplankton species such as *Daphnia carinata*, *Moina* sp., *Ceriodaphnia* sp., *Boeckella* sp., and an unidentified ostracod for over three months. Following multispecies inoculations, one species always became dominant. "Green water" from a mixed algal culture proved a more effective feed than yeast, although excessive quantities of either reduced growth. A protoype automated feeding system has produced densities of *Daphnia carinata* in excess of 10,000 individuals per litre (and climbing!) while manual feeding twice daily maintained densities of up to 8,000 per litre. Future research aims to optimise the methodology and to quantify the population factors initiating ephippia formation in Cladocera.

ECOLOGY OF MACROINVERTEBRATES IN SEASONAL WETLANDS

Adrian Pinder, Murdoch University, Murdoch, W.A., 6150

The macroinvertebrate fauna of two seasonal lakes on the Swan Coastal Plain, Western Australia, Forrestdale Lake and Thomsons Lake. These were sampled over a period of six months, from March 1986 to July 1986. The lakes were sampled when dry to determine whether any macroinvertebrates remained in the sediments during the dry phase. Subsequent sampling at monthly intervals for three months was carried out when the lakes flooded due to the onset of winter rains. Conductivity, pH, nutrient concentration and chlorophyll a were determined from water samples, and organic content of sediment samples was calculated.

The results of physico-chemical sampling revealed that both of the lakes were fresh, alkaline and meso-eutrophic. 78 macroinvertebrate taxa were recorded from the two lakes, 13 species were recorded from the dry lake beds. The density of individuals, species richness and diversity increased at most sites on each subsequent sampling occasion. The class Insecta contained the most species, but the ostracoda were the most abundant in terms of density of individuals. The fauna appeared to be well

adapted to the cycle of flooding and drying. The two lakes were very productive, in terms of species richness and density of individuals, compared to other Australian wetlands. This may be a result of the trophic status of the lakes and their seasonal nature.

Potamopyrgus, A MOLLUSCAN WEED

W.F. Ponder, Australian Museum, Sydney

Potamopyrgus is a small, parthenogenic snail that has long been regarded as a member of the native fauna of Australia. It is very abundant in Tasmania, parts of South Australia and in Victoria where it lives in fresh-water streams and in slightly brackish conditions. The Australian species is, in fact, *P. antipodarum* from New Zealand, and was introduced to Australia in the early 1800s. It only lives in disturbed habitats where it appears to compete with endemic hydrobiid snails, typically reducing populations of these species to very low levels, possibly eventually eliminating them. This species was also introduced to Britain about the same time and has since spread through most of Europe, where it is known as *Potamopyrgus jenkinsi* .In Australia it has only recently been introduced to the Sydney area (first record about 1940) and is now spreading rapidly.

DISEASE IN LOWER MURRAY BONY BREAM

Jim Puckridge, River Murray Laboratory,
Department of Zoology, University of Adelaide

While the populations of many native fishes in the lower Murray have declined since impoundment, bony bream are flourishing, and are now the dominant species. Paradoxically, this species alone is subject to an annual epizootic of skin disease which affects up to 60% of the adult population. Juveniles are not affected. The principal pathogens are *Saprolegnia* sp. and *Aeromonas hydrophila* .Typically, diseased fish have shallow mid-flank lesions thickly invested with fungal mycelia. Low winter water temperatures affect fish behaviour, condition and immune responses. These changes may precipitate the disease outbreaks, although cycles in pathogen density and growth rate could also be important. Effects on bony bream populations have not yet been determined; both healing and dead or moribund fish are extremely rare. However, the species matures early, and is probably well adapted to rapid recovery from massive mortalities.

POLLUTANT REMOVAL IN URBAN WETLANDS

Norrie R. Sanders, National Capital Development Commission

Several studies were undertaken to evaluate shallow ponds and wetlands as retention devices for urban pollutants. The major study measured the performance of a small sedimentation pond which had 30% emergent macrophyte cover. Despite a short hydraulic residence time, the pond retained more pollutants than predicted by deterministic models. The additional retention may have been influenced by the presence of macrophytes and the organic nature of the sediments.

Another study compared the performance of an adjacent marsh which had a 90% emergent macrophyte cover. During low flow periods, the marsh was a more effective pollutant trap than the pond. The mechanisms of pollutant capture in these systems are discussed.

The results of these and other studies have been used to implement a strategy for the control of urban runoff pollution in Canberra. At present a number of shallow ponds are under construction and guidelines for their management are being formulated.

EVOLUTIONARY RELATIONSHIPS AND CONSERVATION GENETICS OF *Gadopsis* spp.

Andrew Sanger, Department of Zoology, University of Adelaide

Recent work has established that there are several species of the freshwater blackfish genus, *Gadopsis*, found in south-eastern Australia. Further, within each of these taxa, there is considerable genetic variation which is of interest both from the evolutionary and conservation viewpoints. Data on the type and extent of this variation are presented, along with a discussion of the evolutionary relationships of the taxa. The means by which this variation may be conserved, and the merits of such conservation are also discussed.

MACROINVERTEBRATE COMMUNITY STUDY OF STREAMS IN WESTERN AUSTRALIA - TOWARDS MONITORING FOR THE FUTURE

Andrew Storey, Aquatic Research Laboratory, Department of Zoology University of Western Australia, Nedlands, WA , 6009.

In December 1984 the Aquatic Research Laboratory initiated a community level study of macroinvertebrates in streams of the northern jarrah forest of Western Australia. The long term aim of the study is the development of a biological monitoring programme, suitable for use by the funding body, the Water Authority of Western Australia.

Temporal and spatial changes in macroinvertebrate community structure are being examined at 30 sites, located in two drainage systems. Final analyses will be based on three years data. Ordination and clustering of sites will be performed using the DECORANA and TWINSPAN programs. By examining correlations between community structure and a range of environmental variables it will be possible to predict macroinvertebrate community structure at new sites. Classification of stream communities by this approach will be of considerable value for water quality monitoring in the future by providing a baseline against which man-induced changes can be assessed.

The background to the study, methodology and preliminary results are presented.

A MICROCOMPUTER PROGRAM FOR CLUSTER ANALYSIS USING A VARIETY OF SIMILARITY COEFFICIENTS

K.F. Walker, River Murray Laboratory,
Department of Zoology, University of Adelaide

Similarity coefficients are a convenient way to compare groups of entities with different attributes. They are often used in surveys and taxonomic investigations. Some require only information about the presence or absence of the given characters; others require measures of abundance. Where several comparisons are made, the groups can be arranged into related "clusters" and shown as a "dendrogram". These procedures are readily carried out using a computer, but many of the programs available are accessible only to mainframe (big computer) users.

CLUSTER3 is a program for use on personal microcomputers. It requires an IBM-PC or compatible (minimum 256K RAM, DOS 2.0+). The program allows the user to create, edit and print data files and to calculate any of six similarity coefficients (Sorensen, Jaccard,

Kulezynski, Mountford, Czekanowski and Raabe). It determines clusters using the method of average linkages, and provides a dendrogram on screen or paper. The program includes "help" screens, and does not require a separate manual. A demonstration will be arranged if possible, and a small number of copies will be available to anyone interested.

WHAT IS A RIVER ANIMAL? COMPARISONS BETWEEN FRESHWATER MUSSEL SPECIES

K.F. Walker, River Murray Laboratory,
Department of Zoology, University of Adelaide

The effects of flow regulation on the aquatic fauna of the River Murray are illustrated by two freshwater mussel species. One, *Alathyria jacksoni*, inhabits the main river channel and does not occur in environments without significant flow. The other, *Velesunio ambiguus*, favours environments with little or no current; it is common in creeks and billabongs and may exploit sheltered pockets along the river margins. It is common in the channel of the lower river, but comparisons with aboriginal middens suggest this is a resut of weir construction. The obligate riverine character of *A. jacksoni* is shown in its adaptive morphology, fixed reproductive cycle and intolerance of dehydration and low oxygen (hypoxia). *V. ambiguus* has a more flexible breeding season and is more tolerant of dehydration and hypoxia. The filtering ability of *V. ambiguus*, but not *A. jacksoni* , declines in the presence of a current. This species may be excluded from free-flowing reaches because it is unable to anchor itself against the current, whereas the absence of *A.jacksoni* from slack waters may reflect its high requirement for oxygen. There are comparable differences between the Murray crayfish (*Euastacus armatus*) and the yabbie (*Cherax destructor*). Intolerance of hypoxia is a key feature distinguishing these species, and may be characteristic of river animals.

AUSTRALIAN FRESHWATER AMPHIPODA

W.D. Williams, Department of Zoology, University of Adelaide,
J.L. Barnard, Smithsonian Institute, Washington DC, USA

Australian freshwater amphipods are placed in several families. The most important of these are those in the crangonyctoid complex. Taxonomic studies of them are badly needed for a variety of reasons. For the past decade, studies have concentrated on those in the crangonyctoid set of families and a monograph detailing the initial part of these studies has recently been submitted for publication. The purpose of the present paper is to indicate the major results of this study. In abstract, the monograph provides a review and inventory of all 26 previously described species of freshwater crangonyctoid amphipods as well as descriptions of seven new species found mixed in type collections or otherwise associated. All extant types have been examined and redescribed. The Australian crangonyctoids belong in the families Paramelitidae and Neoniphargidae and a new family. Four new genera are described to align the classification properly. The Australian crangonyctoids are now placed in the families Paramelitidae, with *Austrogammarus*, *Austrocrangonyx*, *Hurleya*, *Uroctena*, *Giniphargus*, *Protocrangonyx*, and a new genus; the Neoniphargidae, with *Neoniphargus*, and three new genera; and a new family, with *Perthia*. Keys are provided to (1) the world groups of crangonyctoids, (2) Australian crangonyctoids, (3) the genera of each family, and (4) individually for the species of each genus.

SOME DISTINCTIVE FEATURES OF INLAND WATERS IN THE TEMPERATE NORTHERN HEMISPHERE

W.D. Williams, Department of Zoology, University of Adelaide

There are many features of the Australian limnological environment that are distinctive. They include some that are physical (e.g. high turbidity, ephemerality, great hydrological fluctuation, paucity of dimictic lakes), some chemical (e.g. high salinities, predominance of Na^+ and Cl^- in saline waters), and many biological ones (e.g. high endemism, adaptive radiation of certain groups, absence of certain "well-known" freshwater groups). Such distinctiveness has meant that the results of much limnological work overseas needs to be used with caution in managing Australian inland aquatic resources.

Whilst the veracity of the above paragraph is in no doubt, it should clearly be recognised also that Australian inland waters in

manyimportant respects are much more like inland waters outside the northern temperate region than is generally recognised. Thus, outside that region, i.e. in the arid, semi-arid, tropical and semi-tropical parts of the world, many waters are ephemeral, saline, or characterised by flood/drought regimes: exactly those features characteristic of any Australian inland waters. For this reason, Australian limnologists may have a great deal more to say that is useful to limnologists in countries outside Euro/North America than has presently been recognised - and certainly more than limnologists who have studied the highly distinctive waters characteristic in north temperature regions of the world!.

★ *"QUICK! Get word to Mighty Trout!"*

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COMING EVENTS

1987
17-18 SEPTEMBER
National Water Research Seminar, Canberra.
Contact Chairman, AWRAC Organising Committee, C/- Australian Convention Travel Services Pty Ltd, GPO Box 2200, Canberra ACT 2601 (062 498 015).

4-7 OCTOBER
Wetlands creation and restoration, Washington, D.C.
Contact: Barbara B. Haas, Corporate Conservation Council, National Wildlife
Federation, 1412 Sixteenth Street, N.W. Washington, D.C. 20036.

1988
FEBRUARY
International Symposium on Predation on Zooplankton by Organisms other than Fish, Broa, Sao Paulo State, Brazil.
Contact: J.G. Tundisi, Limnological Laboratory, CRHEA Department of Hydrology and Sanitation, USP Av. Dr Carlos Botelho, 1465 Sao Carlos, SP 13560 Brazil.

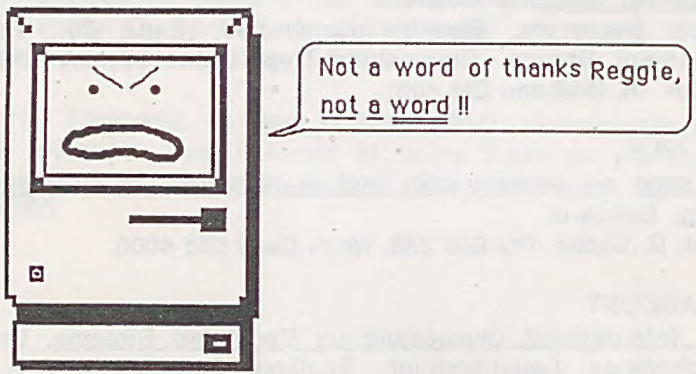
28-30 JUNE
National Seminar and Trade Expo: Managing the marine environment for a fishing future, Brisbane.
Contact: Secretary, Steering Committee (Expo 88), Fisheries Management Branch, Queensland Department Primary Industries, GPO Box 46, Brisbane Qld 4001.

10-15 JULY
Conference on water quality and management for recreation and tourism, Brisbane.
Contact: R. Sadler, PO Box 388, North Quay Qld 4000.

15-19 AUGUST
Fourth International Symposium on Regulated Streams, University of Technology, Loughborough, England. Contact: Dr G.E. Petts, Department of Geography, University of Technology, Loughborough, Leicestershire, LE11 3TU, U.K.

29 AUGUST - 2 SEPTEMBER
First Biennial Water Quality Symposium, Banff Centre, Banff, Alberta, Canada.
Contact: B.J. Dutka and D.L. Liu, Co-Chairmen Water Quality Symposia Committee, NWRI CCIW, PO Box 5050, Burlington, Ontario, Canada L7R 4A6.

11-17 SEPTEMBER
Third International Conference on the Conservation and Management of Lakes "Balaton '88", Keszthely, Hungary.
Contact: Congress Bureau MTESZ, H-1055 Budapest, Kossuth Lajor Ter 6-8, Hungary.



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